

Synchronizing controller detects baud rate

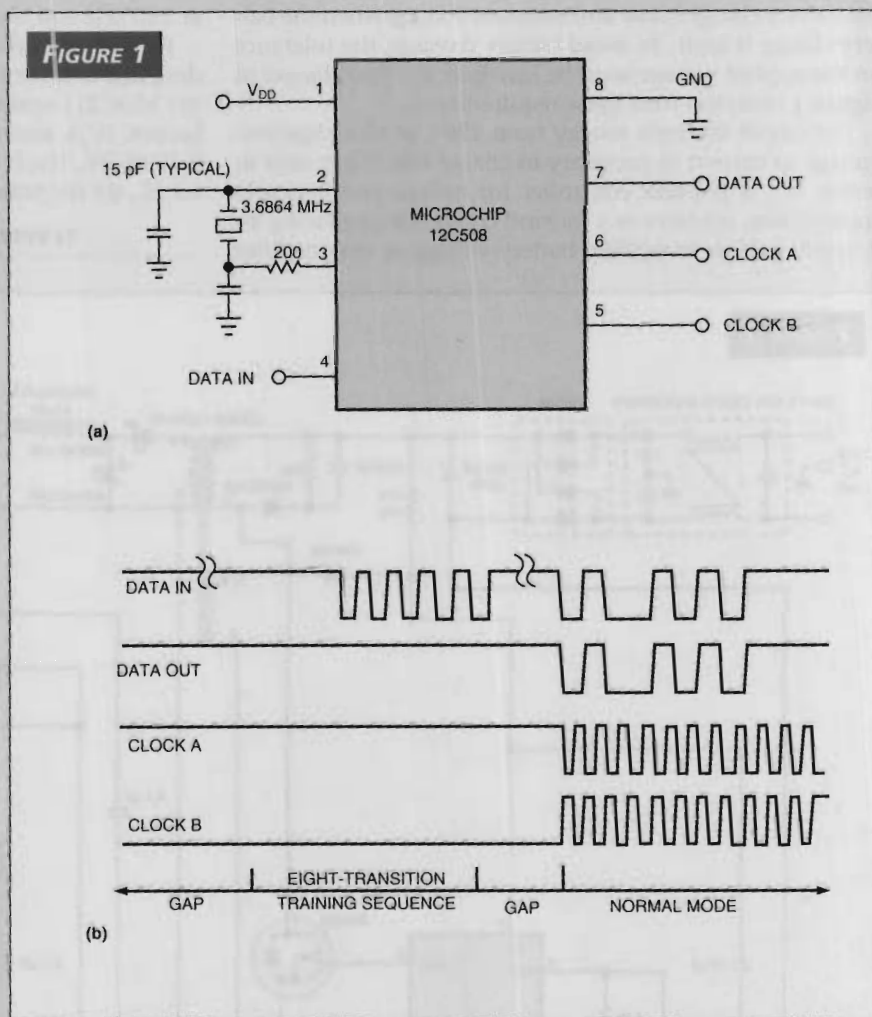
WILLIAM GRILL, RIVERHEAD SYSTEMS, LITTLETON, CO

A simple and inexpensive implementation using an eight-pin 12C508 controller (Microchip Technology, Chandler, AZ) provides both bit-rate detection and a synchronous, appended-clock output from an asynchronous input-data stream (Figure 1a).

This implementation relies on two code sequences (Figure 1b). A training sequence first identifies the bit rate. This sequence begins with register and counter initialization followed by a gap detection. Following the detected, 0.325-sec, high-true gap, the controller monitors eight transitions. Between each transition, a local loop counter counts the number of loops necessary to arrive at the next transition. The controller tests the accumulated number of loops between transitions to identify the count period that resulted in the fewest loops. After processing all eight transitions of the training sequence, the controller evaluates the shortest maintained count according to a table index based on the training loop's code length. Because the controller's timing is crystal-based and the loop's path lengths are equal, the processed count corresponds to the bit rate that the controller then uses to define a delay necessary for the second code sequence.

The second output-code sequence begins by locating a fixed, second gap of approximately 40 msec. This time allows the controller to completely terminate the training sequence before beginning the controller's main iterative loop. The sequence then takes the delay, identified earlier, and processes the serial input data on Pin 4 to the output at Pin 7 while maintaining complementary clocks on pins 5 and 6. Equalizing the instruction paths for this code sequence is a key requirement of this application.

The controller uses a 3.6864-MHz crystal to provide precise baud-rate timing. This scheme allows the combined code applications to support 300- to 9600-bps asynchronous inputs. An 8-bit training pattern of 55 (hex) allows multiple single-bit isolated transitions to qualify the detected bit rate (Figure 1b).



A simple controller (a) provides baud-rate information and a synchronous output clock by using two code sequences (b).

The output-sequence code provides resynchronization of the clock-related delay counters at the input data-transition edges on Pin 4. This resynchronization allows flexibility in supporting data-bit edge delays and distortion and variations in the controller's crystal or external timing reference's accuracy. You can download applicable code from EDN's Web site, www.ednmag.com. At the registered-user area, go into the Software Center to download the file from DI-SIG, #2158. (DI #2158)

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Charge Li-ion batteries from ac line voltage

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Li-ion battery chargers must apply constant current when the battery charge is low and constant voltage when the battery charge is high. To avoid battery damage, the tolerance on the applied voltage must be less than 1%. The charger in Figure 1 complies with these requirements.

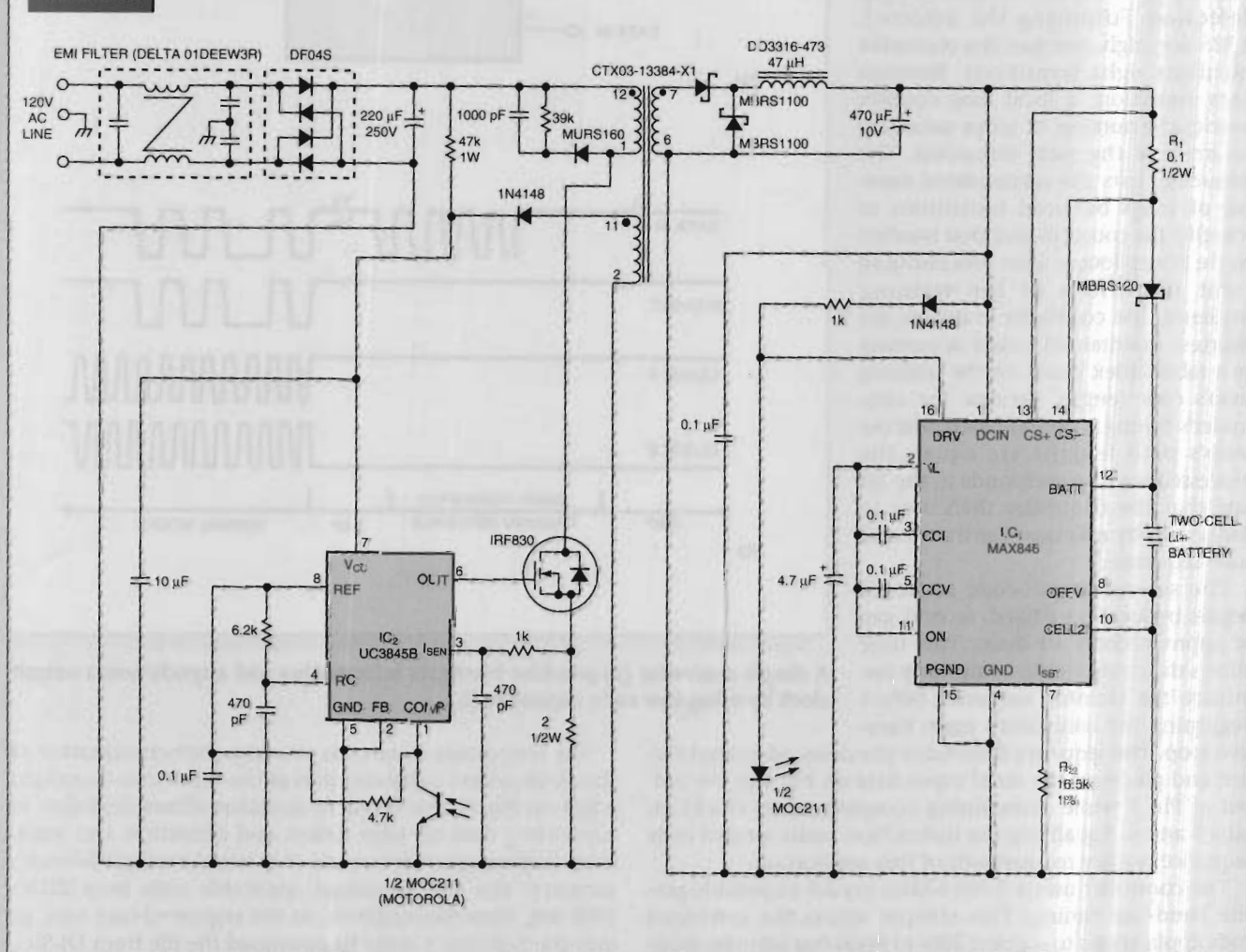
The circuit converts energy from 120V ac to a regulated voltage or current as necessary to charge two Li-ion cells in series. IC₁, a popular controller for offline power-supply applications, operates as a forward converter, producing an isolated, half-wave-rectified battery voltage or current from

the full-wave-rectified line voltage. This converter operates at 250 kHz and handles ac inputs from 90 to 135V.

IC₂ is a chemistry-independent battery charger. Though designed to drive an external transistor, in this case, it drives the MOC211 optoisolator to control IC₁ across the isolation barrier. IC₂'s internal circuitry sets the battery voltage to 8.4V±0.5%. The 0.1Ω current-sense resistor, R₁, and I_{SET} resistor, R₂, set the battery current to 1A±2%. (DI #2161)

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FIGURE 1



A high-voltage controller, IC₁, transformer, and chemistry-independent battery charger, IC₂, charge two-cell Li-ion batteries directly from the ac line.